

A review of the taxonomy and systematics of the Sickle-winged and White-winged nightjars (Caprimulgidae)

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Although South America hosts 30 species of nightjar, many are poorly represented in museum collections and are rarely studied in the field. As a result, the classification of neotropical caprimulgids at a generic level has been largely ignored by modern ornithologists. Twelve South American species are currently placed in *Caprimulgus*, which is the largest genus, whilst the monotypic *Eleothreptus* is one of the most distinctive.

The Sickle-winged Nightjar *Eleothreptus anomalus* and White-winged Nightjar *Caprimulgus candicans* are two of the least known species, but morphological similarities between the two were first noted well over a century ago (Pelzeln 1868). Recent studies now reveal that they also share similar habitat preferences, vocalizations and breeding behaviour, suggesting that they might actually be congeneric (Cleere 1998, 1999). The taxonomy, morphology and ecology of the two species are now reviewed in an attempt to establish their true affinities.

Methods and material

I examined 28 specimens of *Eleothreptus anomalus* (10 males, 15 females and 3 immatures) in the following museums: The Natural History Museum, Tring, U.K. (5); Nationaal Natuurhistorisch Museum, Leiden, Netherlands (3); Muséum national d'Histoire naturelle, Paris, France (1); Museum für Naturkunde, Berlin, Germany (3); Naturhistorisches Museum, Vienna, Austria (6); American Museum of Natural History, New York, U.S.A. (2); Field Museum of Natural History, Chicago, U.S.A. (2) and Museo Nacional de Historia Natural de Paraguay, Asunción, Paraguay (6 – some now deposited in Naturhistoriska Riksmuseet, Stockholm, Sweden and Museum of Natural History, University of Kansas, USA). I also examined 3 specimens of *Caprimulgus candicans* (2 males and 1 immature) at the Naturhistorisches Museum, Vienna, Austria (2) and Museo Nacional de Historia Natural de Paraguay, Asunción, Paraguay (1). I studied a small, breeding population of *Caprimulgus candicans* at Aguará Ñu within the Reserva Natural del Bosque Mbaracayú, Canindeyú, Paraguay, in October 1999, and compared male vocalizations with recent Paraguayan recordings of male *Eleothreptus anomalus*.

The genus *Eleothreptus* G.R.Gray, 1840

In 1837, John Gould exhibited a male nightjar at a meeting of the Zoological Society of London, and later described it as a new genus and species in the Society's

proceedings for that year, which were published in May 1838 (Gould 1838a). He also described the genus and species in part 2 of his *Icones Avium*, which was published in August 1838 (Gould 1838b). The bill, nostrils, rictal bristles, wings, tail, tarsi and feet were described and, as a reference to the bird's unique wing shape, he named the genus *Amblypterus* (from the Greek words *amblyus*, meaning dull or blunt and *pterus* a wing).

In 1840, G.R.Gray considered the generic name to be similar to a word used in entomology and introduced a new name *Eleothreptus* (from the Greek *heleothreptus*, which means marsh-dwelling), the species at that time being only known from marshlands (Gray 1840).

In 1866, P.L.Sclater published the generic name as *Heleothreptus*, and this spelling was chosen over *Eleothreptus* by Hartert (1892), thereby making it an unjustified emendation under ICZN (1999), Article 33 2.3.

Morphological characteristics that separate this genus from *Caprimulgus* are a broader bill, proportionally longer rictal bristles, a short, square tail and partially feathered tarsi. Males also have strongly curved primaries, but the short secondaries

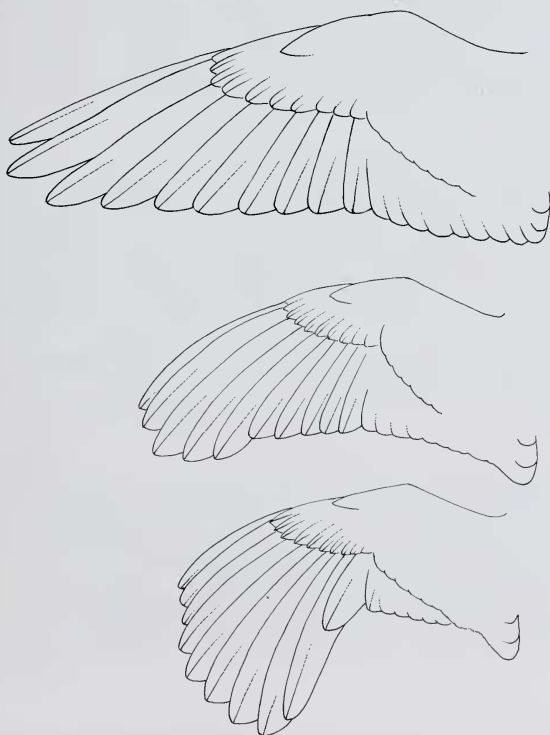


Figure 1. Wing shapes of male nightjars (from top to bottom). a European Nightjar; b White-winged Nightjar; c Sickie-winged Nightjar

of male Sickie-winged Nightjars may have evolved through territorial and courtship display activity and possibly do not constitute a generic character.

Sickie-winged Nightjar *Eleothreptus anomalus* (Gould, 1838)

Taxonomy

Gould's original specimen was also described as a new species (see above) and he gave it the specific name *anomalus*, a latin word meaning strange. Gould did not give a type locality, but as a footnote to the original description, J.E.Gray considered it to be Demerara or the Brazils (Gould 1838a). It was later designated as São Paulo by Pinto (1938). Only one other name exists within the taxonomy of this species. *Caprimulgus mercurius* was simply extracted from a J.J. Natterer manuscript (Burmeister 1856) and published as a synonym of *Eleothreptus anomalus*, thereby making it unavailable under ICZN (1999), Article 11 6.

Museum data

The type specimen described by Gould is deposited in The Natural History Museum, Tring. An accurate inventory of museum study skins has not been undertaken to-date, but a figure of 25 specimens (Pearman & Abadie 1995) appears to be an underestimate, as literature searches and museum studies have so far revealed 57 birds (see Appendix), although this figure does include some recent additions. Numbers in individual institutions are generally small, although the Museu de Zoologia da Universidade de São Paulo in Brazil has 10 specimens (Straube 1990) and the Naturhistorisches Museum, Vienna and The Natural History Museum, Tring have 6 and 5 specimens respectively. Recent additions to collections appear to be few and far between. Two specimens were taken in Santa Catarina, Brazil in 1991 (Teixeira pers comm, Kirwan *et al.* 1999) and an injured bird was collected in Paraná, Brazil in 1996 (Bornschein *et al.* 1996). At least 5 birds were collected in Paraguay in 1998 and 1999, by the Museum of Natural History, Kansas, and the Swedish Museum of Natural History, Stockholm.

Recent records

Four were seen in Córdoba, Argentina (Miatello *et al.* 1991); a pair was studied in Entre Ríos, Argentina, December 1991 – January 1992 (Pearman & Abadie 1995); a small population was studied in Córdoba, Argentina, September – November 1994 (Straneck & Viñas 1994); ten individuals were seen in São Paulo, Brazil between 15 July 1995 and 23 April 1998 (Kirwan *et al.* 1999) and five or six were observed in Minas Gerais, Brazil between 22 June 1996 and 8 November 1998 (Kirwan *et al.* 1999).

Description

A small, sexually dimorphic nightjar, approximately 18 – 20 cm long and relatively short tailed. Males are generally greyish-brown, often tinged cinnamon, and occasionally show an indistinct buffish collar on the hindneck. They have a pale

buffish-white stripe above the eye and an indistinct, greyish-white submoustachial stripe, but lack a white patch on the throat. The primary coverts are cinnamon, which show as a diagnostic pale patch on the closed wing, and the scapulars have distinctive blackish markings, shaped like inverted Christmas trees. The primaries are strongly curved, largely blackish, and the outer six are boldly tipped whitish. The secondaries are extremely short and together with the curved primaries, they form the unique wing shape. The tail is broadly barred cinnamon-buff and the outer three feathers are narrowly tipped whitish or buffish-white. Females are browner, often with longer wings and tails, and lack the distinctive wing shape. The primaries and secondaries are brown, barred tawny and very narrowly tipped buffish-white. Immatures are similar to the adults, although males lack the characteristic wing shape of adult males; juveniles are similar to the adult females (Cleere 1998, 1999).

Range

Central and eastern Brazil, eastern Paraguay and north-eastern Argentina. Probably resident throughout most of its range, although may be a migrant only (September - March?) in the south. Occurs in open country from Distrito Federal and Minas Gerais in Brazil, south and south-west through southern Brazil and eastern Paraguay to Córdoba and Buenos Aires in north-eastern Argentina. Further Argentine records from Catamarca and Salta appear to be unsubstantiated (Collar *et al.* 1992).

Habitat

Inhabits seasonally flooded grasslands (Miatello *et al.* 1991, Straneck & Viñas 1994), savanna and grassland with marshes, streams and areas of surface water (Cleere 1998), grassland close to dry degraded woodland and water (Kirwan *et al.* 1999) and gallery forest, chaco-type woodland and transitional woodland, often near water or marshland (Collar *et al.* 1992, Pearman & Abadie 1995).

Vocalizations and behaviour

Crepuscular and nocturnal. Calls include rapid *chip*, *tchup* or *tchut* notes, which may be rather weak. Females also utter harsh *gzee*, *gzee* sounds (Straneck & Viñas 1994, Cleere 1998).

In the breeding season, males perform short display flights during which they make muffled wing flapping sounds (Straneck & Viñas 1994).

Roosts and nests on small patches of bare earth amongst clumps of vegetation. Often sits on roads, tracks and low perches at night. When foraging, the fluttery flight is interspersed with glides and sudden changes of direction. Also hunts from the ground by making short sallies (Straneck & Viñas 1994, Pearman & Abadie 1995, Cleere 1998).

Eggs

Very few eggs of this species appear to have been found, collected, or described in the literature. Two were taken on 17 November in São Paulo, Brazil (Ihering 1902);

two on 28 November 1925 in Rio Grande do Sul, Brazil (Lowen 1999) and one in mid November in Santiago del Estero, Argentina (Pereyra 1950). There is also an egg deposited in the Western Foundation for Vertebrate Zoology (catalogue no. 154.874), collected on 7 October 1936 in Minas Gerais, Brazil. The eggs are elliptical, 23.2 - 31.4 x 18.2 - 22.8 mm, have a buffish or pinkish-buff ground colour, and are finely spotted and scrawled brown and grey.

White-winged Nightjar *Caprimulgus candicans* (Pelzeln, 1866)

Taxonomy

First mentioned by Azara (1805), a Spanish army officer serving in Paraguay, who called it 'Ibiyau alas y cola blancas'. Subsequently, this name was mistakenly treated by many authors as a synonym of *Caprimulgus leucurus* Vieillot, 1817 (= *C. cayennensis* Gmelin, 1789).

A male was eventually collected by J.J. Natterer in 1823, and given species number 530 in his unpublished catalogue. Pelzeln later described it as *Stenopsis candicans* (*candicans* being the Latin word for whitish) and sent a copy to P.L. Sclater, who published it in the second of his papers on American Caprimulgidae, in the Proceedings of the Zoological Society of London for 1866. The type locality was given as Irisanga, Brazil by Pelzeln (*In Sclater 1866*), and Orissanga, São Paulo by Collar *et al.* (1992). Natterer also obtained a nightjar (catalogue number 1150) from Baron von Langsdorf, a German naturalist and collector who was the Russian consul to Brazil at the time (Jobling 1991). Pelzeln named it *Stenopsis langsdorfi* after the collector and his description was also published by Sclater, but with Sclater's cautionary note that owing to the variations of age and sex within the Caprimulgidae, it could turn out to be only the young female of *S. candicans*. The type locality for this specimen was listed as Cuyaba, Brazil by Pelzeln (*In Sclater 1866*), and Cuiabá, Mato Grosso, by Collar *et al.* (1992). *S. langsdorfi* was eventually treated as a synonym of *S. candicans* by Hartert (1892), an action which has subsequently proved to be correct. The genus *Stenopsis* Cassin, 1850 was subsequently found to be preoccupied by *Stenopsis* Rafinesque 1815, a genus of Coleoptera, and was renamed *Thermochalcis* by Richmond (1915). Peters (1940) later subsumed *Thermochalcis* into *Caprimulgus*.

Museum data

The type specimens of both *Stenopsis candicans* and *Stenopsis langsdorfi* are deposited in the Naturhistorisches Museum in Vienna. A male taken on 11 September 1987 in Bolivia and housed in the Museo de Historia Natural Noel Kemff Mercado, Santa Cruz represents the first record for that country (Davis & Flores, 1994). There is also a recent specimen, a male, in the Museo Nacional de Historia Natural de Paraguay, Asunción (Capper *et al.* 2000).

Recent records

Small numbers seen during August – October in Emas National Park, Brazil in the 1980s, with a maximum count of 12 in September 1985, although it was speculated that the area might support hundreds of birds (Collar *et al.* 1992). After the last sighting in October 1990, there were no further published records from this site until a male was seen and photographed in November 1997 (Rodrigues *et al.* 1999). A small population was discovered in the Reserva Natural del Bosque Mbaracayú, Paraguay during July – December 1995 (Lowen *et al.* 1996, 1997) and the area possibly supports a population of up to 60 pairs (Capper *et al.* 2000). No further sightings have yet been reported from Bolivia.

Description

A small, sexually dimorphic nightjar, approximately 19 – 21 cm long. Males are generally greyish-brown, often tinged cinnamon, and have no collar on the hindneck. They have a whitish stripe above the eye and a whitish submoustachial stripe, but lack a white patch on the throat. Some outer lesser coverts, the alula and the primary coverts are mostly white, although this is not generally visible on the closed wing. The scapulars have strong blackish markings, which are occasionally shaped like inverted Christmas trees. The primaries are curved and are largely white proximally, blackish distally, the amount of white increasing on each feather towards the body. The secondaries are also mostly white, as is the tail, with only the central pair of tail feathers being pale greyish-brown. Females are browner, completely lack white in the plumage, and the primaries and secondaries are brown, regularly barred pale tawny. Immatures and juveniles are similar to adult females (Cleere 1998, 1999).

Range

Central and south-western Brazil, eastern Paraguay and northern Bolivia. Probably resident throughout its range. Occurs in open, lowland country in Goiás, Brazil and Canindeyú, Paraguay. There are historical records from Mato Grosso and São Paulo, Brazil (see Museum data). The modern record from Beni, Bolivia (Davis & Flores 1994) remains an isolated one to-date.

Habitat

Inhabits open grasslands and cerrado with scattered trees, bushes, dwarf palms, termite mounds and anthills (Pelzeln 1868, Collar *et al.* 1992, Clay *et al.* 1997, Lowen *et al.* 1997). Possibly favours areas that are regenerating after fires (Collar *et al.* 1992, Rodrigues *et al.* 1999), although further research is recommended (Capper *et al.* 2000).

Vocalization and behaviour

Crepuscular and nocturnal. Males give undulating whistles during territorial disputes or when alarmed. Females utter sharp, single notes (Cleere 1998).

In the breeding season, males perform short display flights from low termite mounds, during which they make rapid, wing fluttering sounds (Clay *et al.* 2000), the white wing and tail feathers being extremely noticeable.

Roosts and nests on small patches of bare soil in cerrado or grassland, usually beneath overhanging grasses and plants. Appears to rely on crypsis less than other nightjar species, using nearby vegetation for protection during the day. Does not appear to sit on roads and tracks at night, but frequently uses low perches. When foraging, flight is often slow and interspersed with frequent glides. At other times, flight is strong and direct with a series of double wing beats and short glides.

Eggs

The first eggs of this species were discovered in Canindeyú, Paraguay on 22 November 1997 (Capper *et al.* 2000). As a result of intensive field studies, several nests have been found in the same region during the years 1998, 1999 and 2000 (Pople pers. comm.). The eggs are elliptical, 28.7 – 28.9 x 21.3 – 21.4 mm, have a buffish or creamy-brown ground colour and are finely spotted and scrawled grey, black and brown.

Conclusion

The Sickie-winged and White-winged Nightjars are two poorly known, neotropical species that share similar morphological features, vocalizations, behavioural traits and habitat preferences. Both have restricted ranges, occurring in open grasslands in southern South America, generally where there are reddish soils. They are both sexually dimorphic. Males have cinnamon-tinged, cryptic plumages and lack the white mid-wing and outer tail markings typically found in the genus *Caprimulgus*. Females have a brownish, variegated plumage, although they do not appear to nest or roost on leaf litter. Males have curved primaries (Fig. 1b & c) which, during territorial and courtship display flights, produce a flapping sound quite unlike the deliberate clapping given by many *Caprimulgus* nightjars, which have straighter primaries (Fig. 1a). The wings of the males have also evolved to different extremes. The Sickie-winged Nightjar has the strangest shaped wing of all nightjar species, and appears to have a sound-orientated display flight. The White-winged Nightjar has more white in the wing than any other species, and appears to have a more visual display. In between display flights, the males of both species give similar, soft, call notes, although descriptions of these vocalizations have yet to be published. The eggs of both species are rather similar, having a buffish ground colour with fine markings, and differ from those of most *Caprimulgus* eggs, which generally have a whitish ground colour and are boldly spotted and blotched. Both species also share the broader bill, proportionally longer rictal bristles and partially feathered tarsi, which further differentiate them from *Caprimulgus* nightjars.

The White-winged Nightjar is clearly not a *Caprimulgus* species, but because of its extreme scarcity, it has languished within this genus since 1940. My studies

suggest that it is probably a close relative of the Sickie-winged Nightjar and therefore also belongs in the genus *Eleothreptus*. The systematics for the genus *Eleothreptus* should now be:-

***Eleothreptus* Gray G.R. 1840**

Amblypterus Gould 1838, *Proc. Zool. Soc. Lond.* 1837, p. 105.

- for publication date, see Sclater P.L. 1893, *Proc. Zool. Soc. Lond.* 1893, p. 437.
- junior homonym of *Amblypterus* Agassiz 1833, *Poiss. Foss.* 11 (1), p. 28. (fossil fish).
- incorrect subsequent spelling *Ampllypterus* Wiegmann 1838, *Arch. f. Nat.* 4 (2), p. 380.

Type, by original designation and monotypy, *Amblypterus anomalus* Gould 1838.

Eleothreptus Gray G.R. 1840, *List Gen Bds.* p. 7.

- published as a *nomen novum* for *Amblypterus* Gould 1838, *Proc. Zool. Soc. Lond.* 1837, p. 105.
- incorrect subsequent spelling *Eleotreptus* Lesson 1843, *L'Echo Monde Savant* 10th year, Pt. 2 no. 5, col. 109.
- incorrect subsequent spelling *Heleothreptus* Sclater P.L. 1866, *Proc. Zool. Soc. Lond.* 1866, p. 143.

Heleothreptus Hartert 1892, *Cat. Birds Brit. Mus.* Vol. 16, p. 593.

- unjustified emendation of *Eleothreptus* (Gray G.R. 1840), see ICZN (1999), Art. 33 2.3.

***Eleothreptus anomalus* (Gould 1838)**

Amblypterus anomalus Gould 1838, *Proc. Zool. Soc. Lond.* 1837, p. 105.

- for publication date, see Sclater P.L. 1893, *Proc. Zool. Soc. Lond.* 1893, p. 437.

Caprimulgus mercurius Burmeister 1856, *Syst. Ueber Thiere Bras.* Pt. 3, (Aves), p. 383.

- based on a Natterer manuscript.
- published as a synonym of *Eleothreptus anomalus*, and unavailable under ICZN (1999), Art. 11 6.

***Eleothreptus candicans* (Pelzeln 1866)**

Stenopsis candicans Pelzeln 1866, *In Sclater P.L., Proc. Zool. Soc. Lond.* 1866, p. 588.

- based on a Natterer manuscript, species no. 530.
- also based on the "Ibiyau alas y cola blancas" in Azara 1805, *Apunt. Hist. Nat. Paraguay*, Vol. 2, p. 554.

Stenopsis langsdorffi Pelzeln 1866, In Sclater P.L., *Proc. Zool. Soc. Lond.* 1866, p. 589.

- based on a Natterer manuscript, species no. 1150.
- incorrect subsequent spelling *langsdorfi* Pelzeln 1868, *Orn. Bras.* Pt. 1, p. 12.

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Appendix 1:
Museum study skins - Sickie-winged Nightjar

<i>Museum</i>	<i>sex</i>	<i>date</i>	<i>locality</i>
AMNH477064	?	1850	Brazil
AMNH239449	?	—	—
BMNH1888.8.1.167	F	—	S. Brazil
BMNH1890.2.18.184	F	19-01-1823	Irisanga, Brazil
BMNH1925.7.3.25	M	April 1924	Caravini, Villarica, Guaira, Paraguay
BMNH1885.11.20.333	F	31-03-1877	N. Buenos Aires, Argentina
BMNHvell.cat.31.71a	M	—	Demerara, Brazil [Holotype]
FMNH189705	F	01-01-1946	Fazenda Gaviao, São Paulo, Brazil
FMNH189712	Imm	18-01-1946	Fazenda Gaviao, São Paulo, Brazil
LSUMZ65133	?	Oct. 1964	Itapetinga, São Paulo, Brazil
MACN?	M	12-11-1937	Tostado, Sante Fe, Argentina
MACN?	F	25-04-1938	Tostado, Sante Fe, Argentina
MACN?	F	15-02-1939	Tostado, Sante Fe, Argentina
MACN?	M	04-02-1945	Tostado, Sante FE, Argentina
MACN?	M	08-02-1945	Tostado, Sante Fe, Argentina
MCZ199980	F	18-11-1900	Paranapiacaba, São Paulo, Brazil
MCZ76434	?	—	Demerara trade skin
MHNCI4240	M	27-08-1994	Fazenda Santa Rita, Paraná, Brazil
MHNCI2578	F	1946	E. Paraná, Brazil
MHNCI2853	F	12-08-1988	Laranjeiras, Piraquara, Paraná, Brazil
MIZS?	F?	?	Colonia Risso, Rio Apa, Paraguay [lost?]
MN35383	?	28-09-1978	Brasilia NP, Distrito Federal, Brazil
MN?	?	03-06-1991	Rio Novo, Santa Catarina, Brazil
MN?	?	20-09-1991	Quatro Barras, Santa Catarina, Brazil
MN36551	F	11-11-1986	Canbúi, Curitiba, Paraná, Brazil
MNHN1874.330	F	—	Ipanema, São Paulo, Brazil
MNHNP001245	F	14-03-1992	E. Meigareyo, Isla Yacyreta, Paraguay
MNHNP?	M	22-10-1999	Yababery, Misiones, Paraguay
MZUSP13071	M	—	E. São Paulo, São Paulo, Brazil
MZUSP6071	F	04-11-1906	Ipiranga, suburb of São Paulo, Brazil
MZUSP16218	F	Dec. 1931	Ipiranga, suburb of São Paulo, Brazil
MZUSP14530	F	Oct. 1932	Ipiranga, suburb of São Paulo, Brazil
MZUSP1702	F	Nov. 1900	Alto da Serra, Cubatão, São Paulo, Brazil
MZUSP13832	F	20-10-1932	Moji das Cruzes, São Paulo, Brazil
MZUSP13829	M	24-07-1933	Moji das Cruzes, São Paulo, Brazil
MZUSP31806	F	22-11-1947	Rio das Pedras, São Paulo, Brazil
NMW41.610	F	20-11-1820	Curitiba, Paraná, Brazil
NMW41.608	F	22-07-1820	Ciméterio do Lambari, São Paulo, Brazil
NMW41.611	M	01-03-1821	Itararé, Rio De Janeiro, Brazil
NMW41.609	M	24-11-1819	Ipanema, São Paulo, Brazil
NMW41.612	F	03-03-1821	Itararé, Rio De Janeiro, Brazil
NMW41.608	F	Sept. 1819	Ipanema, São Paulo, Brazil
NRM986749	F	05-11-1998	Yababery, Misiones, Paraguay
NRM986737	M	12-04-1998	Yababery, Misiones, Paraguay
RMNHcat.no.1	F	—	Brazil

RMNHcat.no.2	F	01-12-1818	Mato Dentro, São Paulo, Brazil
RMNHcat.no.3	M	09-01-1819	Goyao, São Paulo, Brazil
UKNHM90188	M	21-10-1999	Yababery, Misiones, Paraguay
UKNHM90189	F	22-10-1999	NW Ayolas, Yababery, Misiones, Paraguay
USNM335188	F	23-07-1933	Moji das Cruzes, São Paulo, Brazil
ZMB9001	M	—	Brazil
ZMB B295	M	—	Porto Alegre, Brazil
ZMB B295	F	—	Porto Alegre, Brazil
ZMKU70.553	F	03-08-1847	Lagoa Santa, Minas Gerais, Brazil
ZMKU?	F	—	Lagoa Santa, Minas Gerais, Brazil [lost?]

Appendix 2:
Museum study skins - White-winged Nightjar

<i>Museum</i>	<i>sex</i>	<i>date</i>	<i>locality</i>
CBF0624	M	11-09-1987	Beni, Yucuma, Bolivia
MNHNP?	M	1997	Aguara Ñu, Canindeyú, Paraguay
NMW40.665	M	06-01-1823	Irisanga, Sao Paulo, Brazil [Holotype]
NMW40.664	Imm	1823/1825	Cuyaba, Matto Grosso, Brazil [Holopte - S.langsdorfi]

Key :

M	male	F	female	
Imm	immature	?	data unconfirmed	— no data
AMNH	American Museum of Natural History, New York, USA.			
BMNH	The Natural History Museum (British Museum of Natural History), Tring, UK.			
CBF	Colección Boliviana de Fauna, Museo Nacional de Historia Natural. La Paz, Bolivia.			
FMNH	Field Museum of Natural History, Chicago, USA.			
LSUMZ	Louisiana State University Museum of Zoology, Baton Rouge, USA.			
MACN	Museo Argentino de Ciencias Naturales, Buenos Aires, Argentine.			
MCZ	Museum of Comparative Zoology, Harvard, USA			
MHNCI	Museu de História Natural 'Capão da Imbuia', Curitiba, Brazil.			
MIZS	Museo ed Istituto di Zoologia Sistemática, Università di Torino, Turin, Italy.			
MN	Museu Nacional da Universidade Federal do Rio de Janeiro, Brazil.			
MNHN	Muséum national d'Histoire naturelle, Paris, France.			
MNHNP	Museo Nacional de Historia Natural de Paraguay, Ascuncion, Paraguay.			
MZUSP	Museu de Zoologia da Universidade de São Paulo, Brazil.			
NMW	Naturhistorisches Museum Wien, Vienna, Austria.			
NRM	Naturhistoriska Riksmuseet (Swedish Museum of Natural History), Stockholm, Sweden.			
RMNH	Nationaal Natuurhistorisch Museum (formerly Rijksmuseum van Natuurlijke Historie), Leiden, Netherlands.			
UKNHM	University of Kansas Natural History Museum, Kansas, USA.			
USNM	National Museum of Natural History, Smithsonian Institution, Washington DC, USA.			
ZMB	Museum für Naturkunde, Berlin, Germany.			
ZMKU	Zoologisk Museum, Københavns Universitet, Copenhagen, Denmark.			